



A status assessment of water quality on US Fish and Wildlife Refuges in the Southeastern US

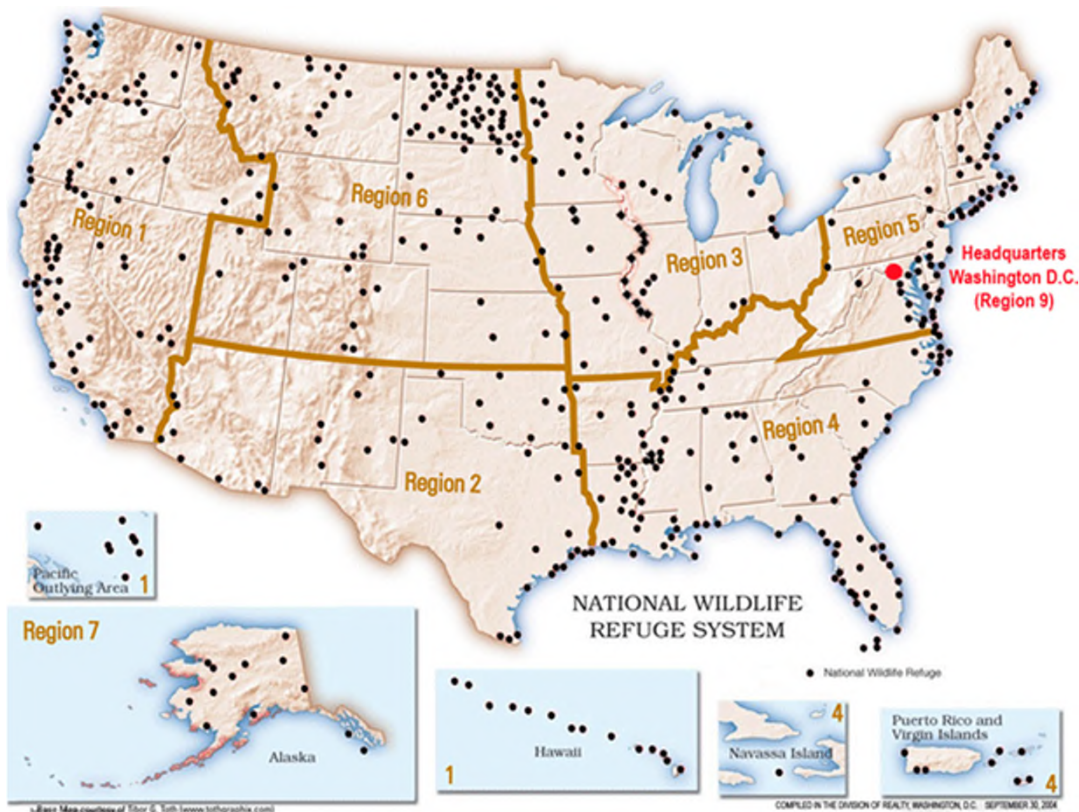
Michelle Moorman, US Fish and Wildlife Service, Inventory and Monitoring Program

Holly Hutcheson, Abigail Knapp, Melissa Creviston, Todd Rasmussen, Adam Milewski, University of Georgia



The mission of the United States Fish and Wildlife Service is, "... working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people."

- 566 Refuges nationwide includes 100 million acres of land and 750 million acres of oceans
- 131 Refuges in the southeast
- The Inventory & Monitoring program provides science support to advance **scientific-based conservation planning and management at multiple spatial scales**





Water resources are fundamental to Refuge Management

- SE Region has ~\$5.6 billion of water-related assets

Asset Type	No. Assets	Cost
Waterfowl production	1583	\$3,996,971,690
Infrastructure	957	\$1,463,891,456
Water and wastewater treatment	377	\$131,955,225



Source: USFWS SAMS database



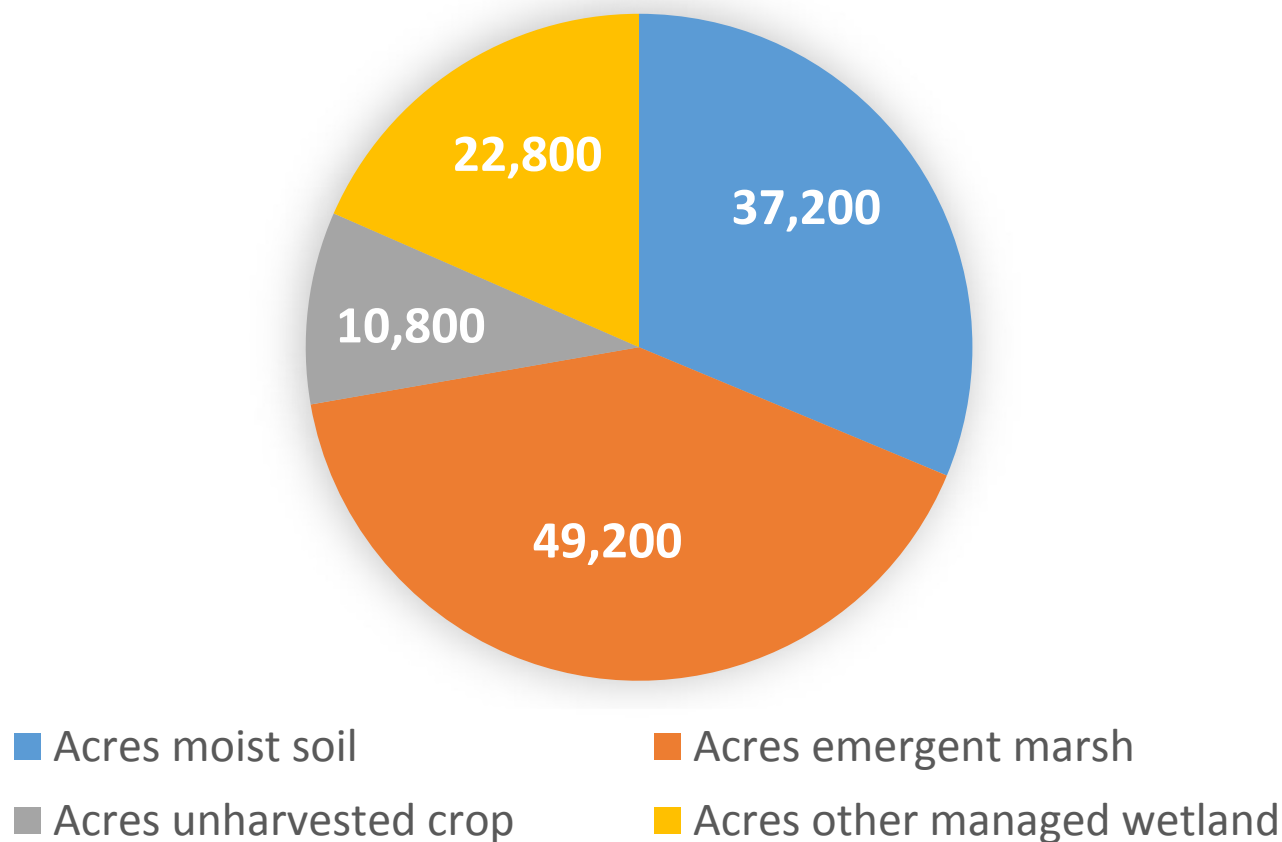
USFWS manages 1.36 million acres of forested wetlands in the southeast



Ghost forests are occurring on refuge lands in eastern North Carolina and throughout the southeast



120,000 Refuge acres are actively managed for 5.2 million waterfowl in Southeast



Source: Unpublished data, Heath Hagy, R4 regional waterfowl ecologist

**USFWS... the lying neighbor
nobody should trust**

GOOGLE Red Wolf Restoration Scandal



CANYAN



NWRS monitors water resources as a result of the Refuge Improvement act of 1997

“assist in the maintenance of adequate water quantity and water quality to fulfill the mission of the System and the purposes of each refuge”, and to “acquire, under State law, water rights that are needed for refuge purposes”

81% of Southeast Refuges have aquatic habitat management as a primary focus



Moist soil management is a key tool Refuges use to provide habitat for wintering waterfowl



Algal bloom at Wapanocca Lake, Wapanocca NWR



Inventory & Monitoring National Objectives: Develop an accurate reconnaissance-level assessment of water resources on refuges:

- Inventory baseline information on natural setting, water rights, water quantity, water quality, water management, and climate, threats to water supplies, and other water resource issues for each Refuge
- Capture data in national database to answer questions at refuge, regional, and national scales
- Prioritize and implement monitoring and management recommendations

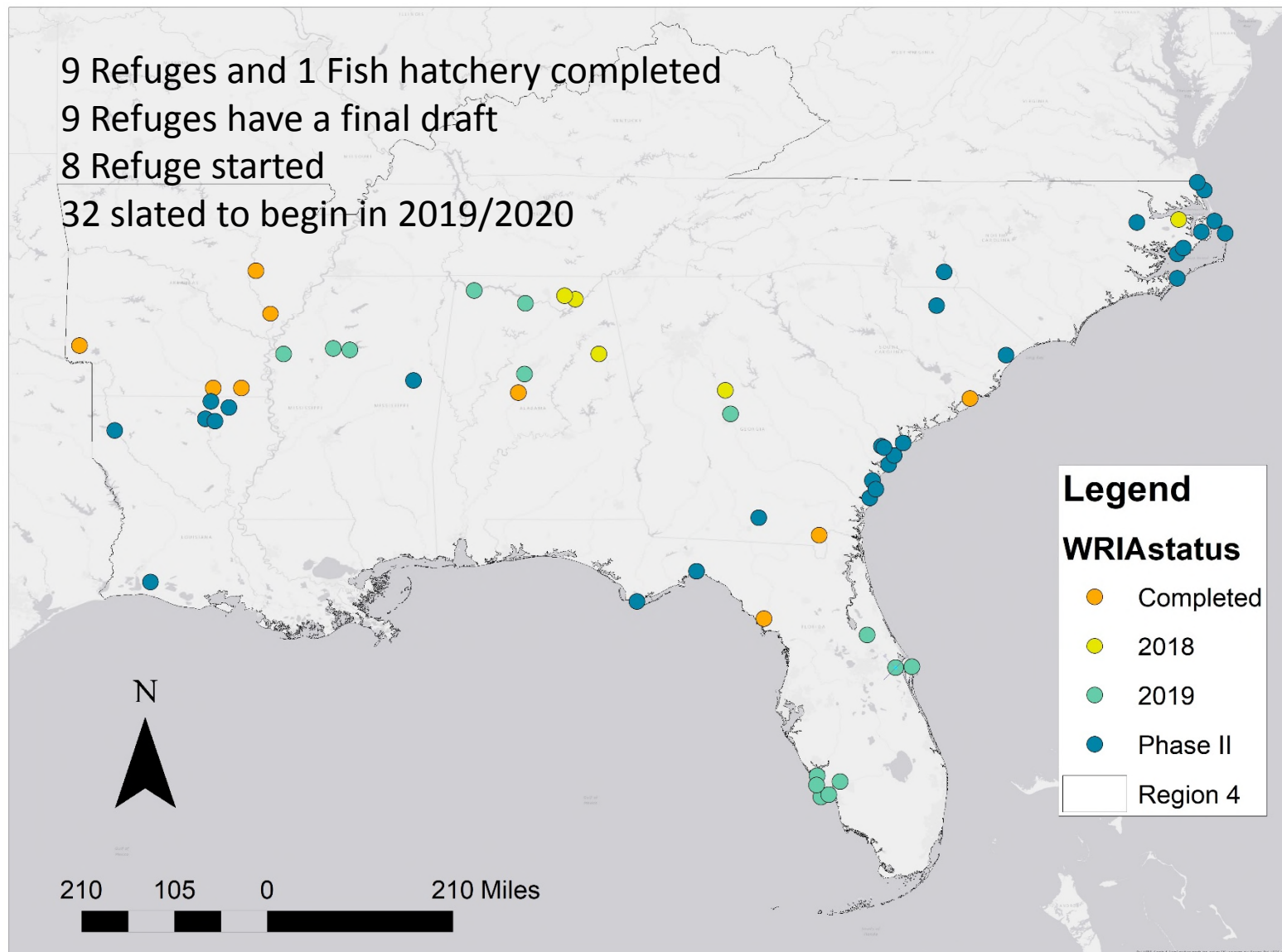


Pond Creek NWR



Region 4 Water Resource Inventory and Assessment Status

9 Refuges and 1 Fish hatchery completed
9 Refuges have a final draft
8 Refuge started
32 slated to begin in 2019/2020





Water Resource Inventories and Assessments are the first step to understanding our water resources

Refuges

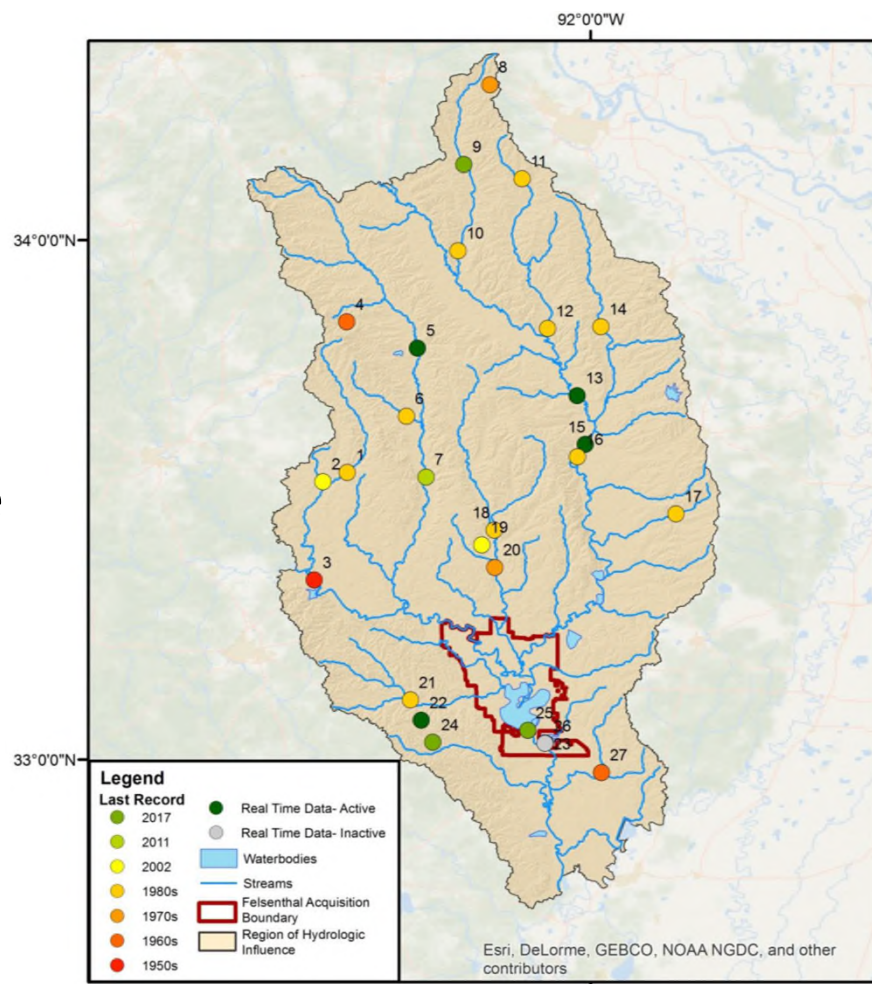
- Provide Refuge specific documents and monitoring data

I&M staff

- Coordinate process
- Conducts threats and needs assessment for national database and report

University of Georgia

- Inventory water resource monitoring from state, federal and local sources
- Produce reports, maps and geospatial database for Refuge





WRIAs improve our understanding and guide our monitoring and research efforts

- Threats and Needs assessments completed for 24 Refuges and entered into national database
- Regional Assessments have been conducted for water-quality impairments, storm tides during 2018, and availability of water-quality data
- Since 2011, I&M program has invested over \$800k to fund over 32 water resource monitoring and research projects on Refuges identified through WRIA process

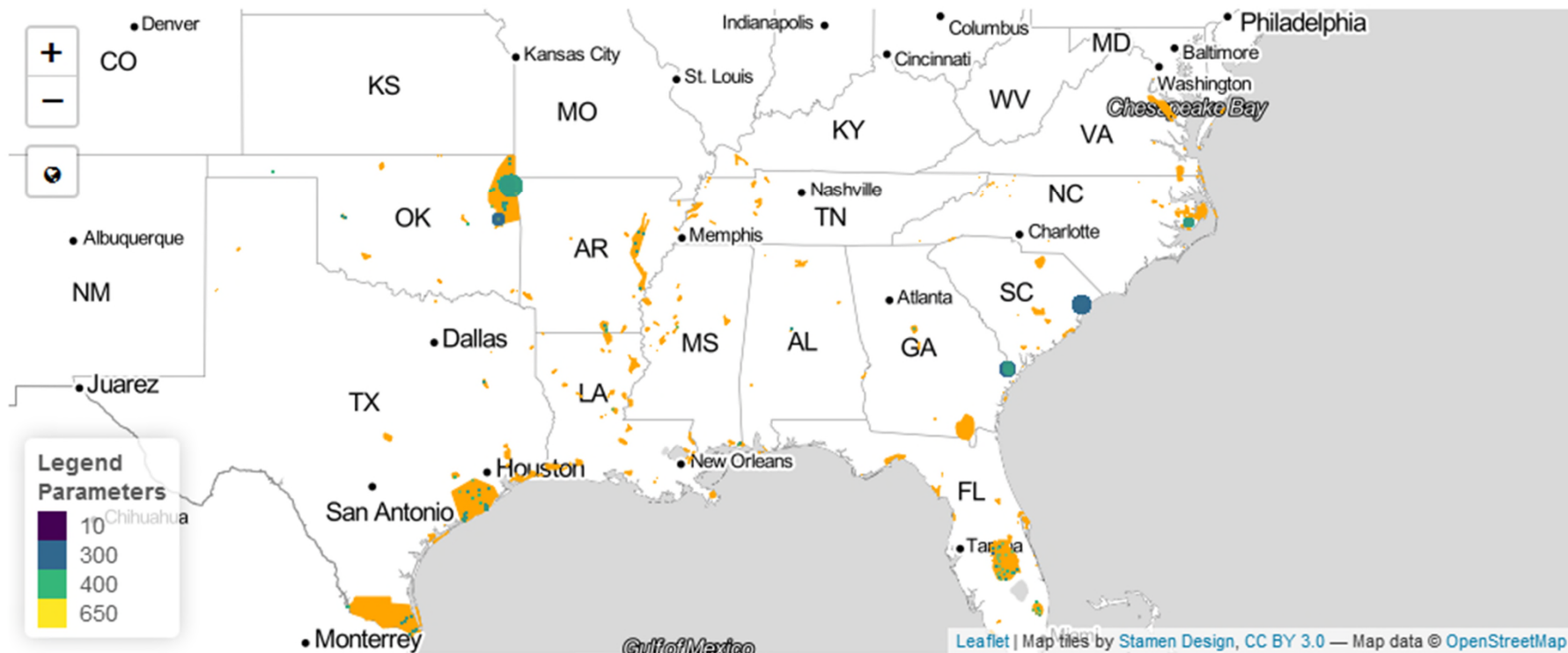


*Water Monitoring Station at
Overflow NWR funded by I&M*



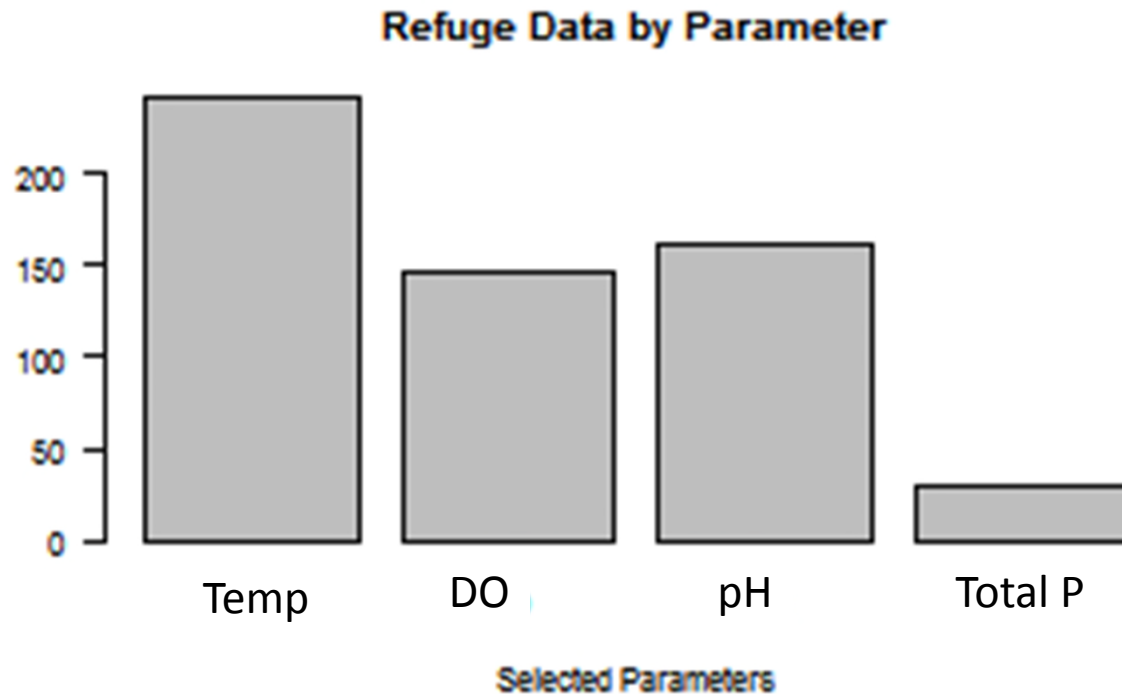
UGA has an Rshiny tool in development that utilizes USGS Rtools and allows us to query Water Quality Portal for Refuge Specific Data

Data Availability in the All Refuges





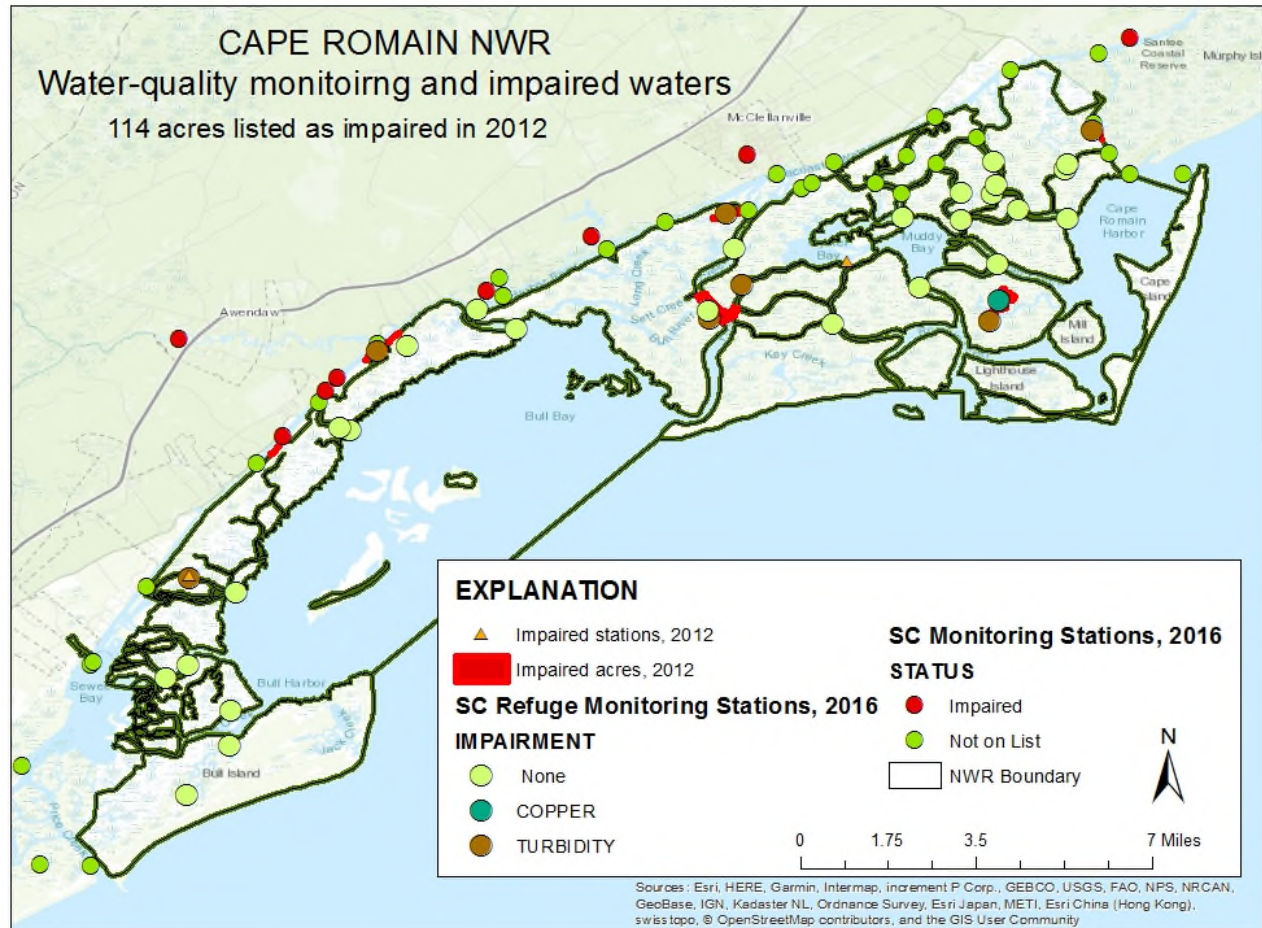
UGA has an Rshiny tool in development that utilizes USGS Rtools and allows us to query NWIS for Refuge Specific Data





NWRS water quality impairments were summarized regionally, with Refuge specific report produce for SC Lowcountry Complex

125,000 acres of impaired water bodies and 577 miles of impaired waterways within the 131 Southeastern Refuges

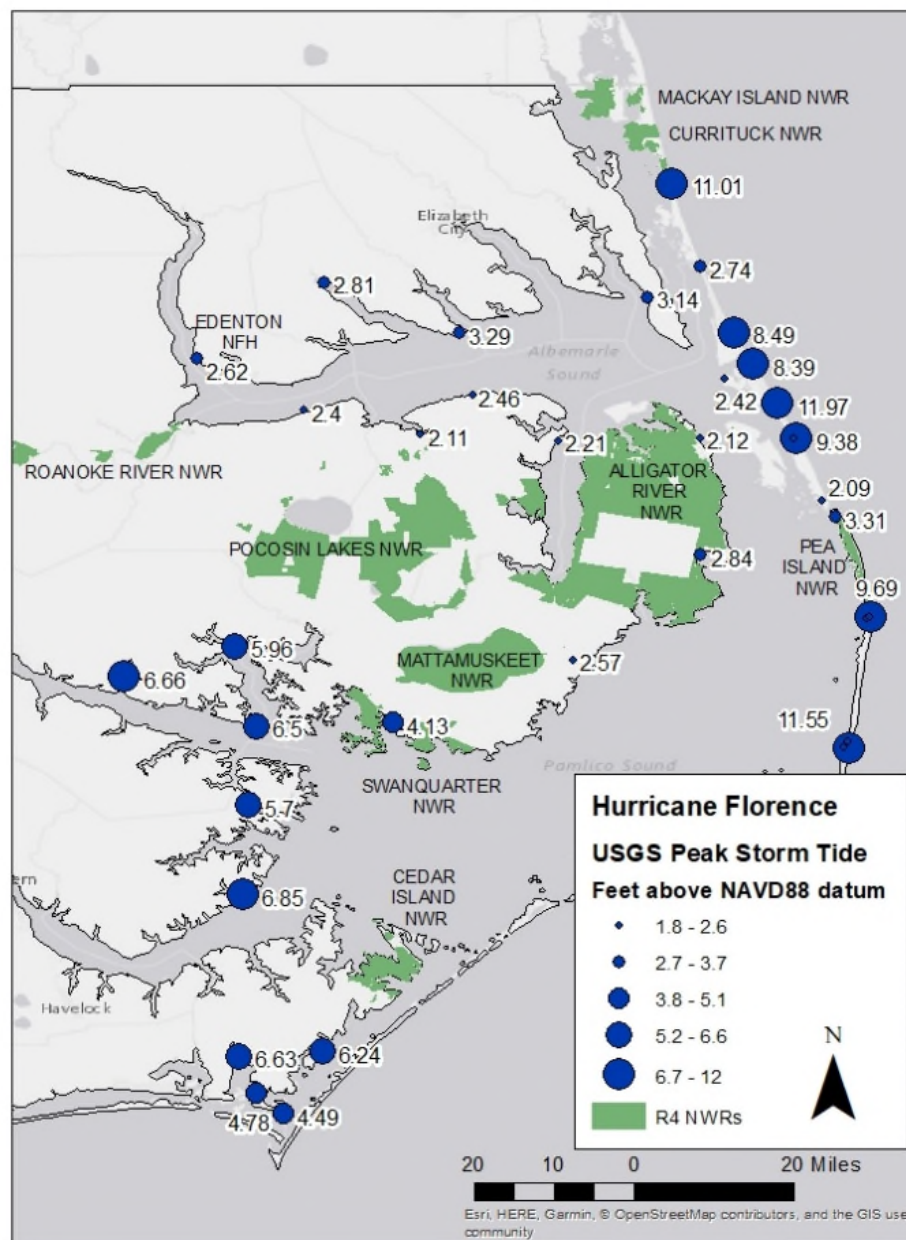


Sources: EPA Office of Water (OW): 303(d) Listed Impaired Waters NHDPlus Indexed Dataset and SC DHEC databases.



Peak storm tides in 2018

- Utilized USGS storm tide data to capture peak storm tides within 20 miles of Refuges
- Developed regional report showing the level of storm tides and relevant hydrographs for each storm
- Goal is to track peak storm tides through time and better understand extent of inundation and saltwater intrusion in coastal wetlands



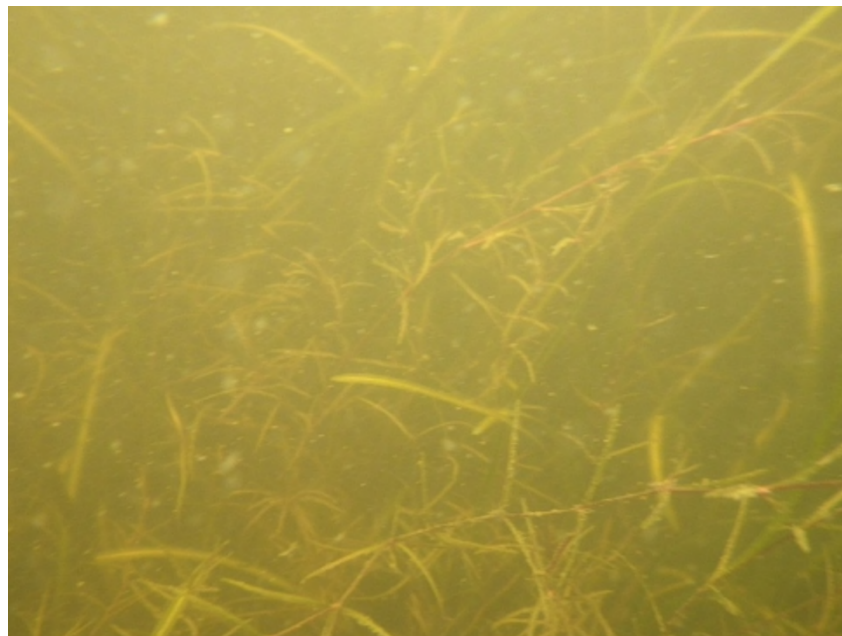


Refuge Focus: Mattamuskeet NWR, NC

The loss of submerged aquatic vegetation was identified as a threat by Refuge Management



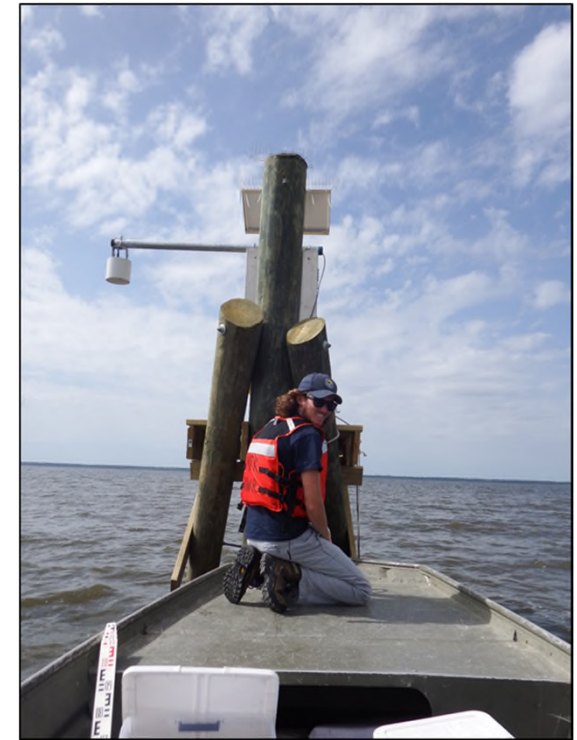
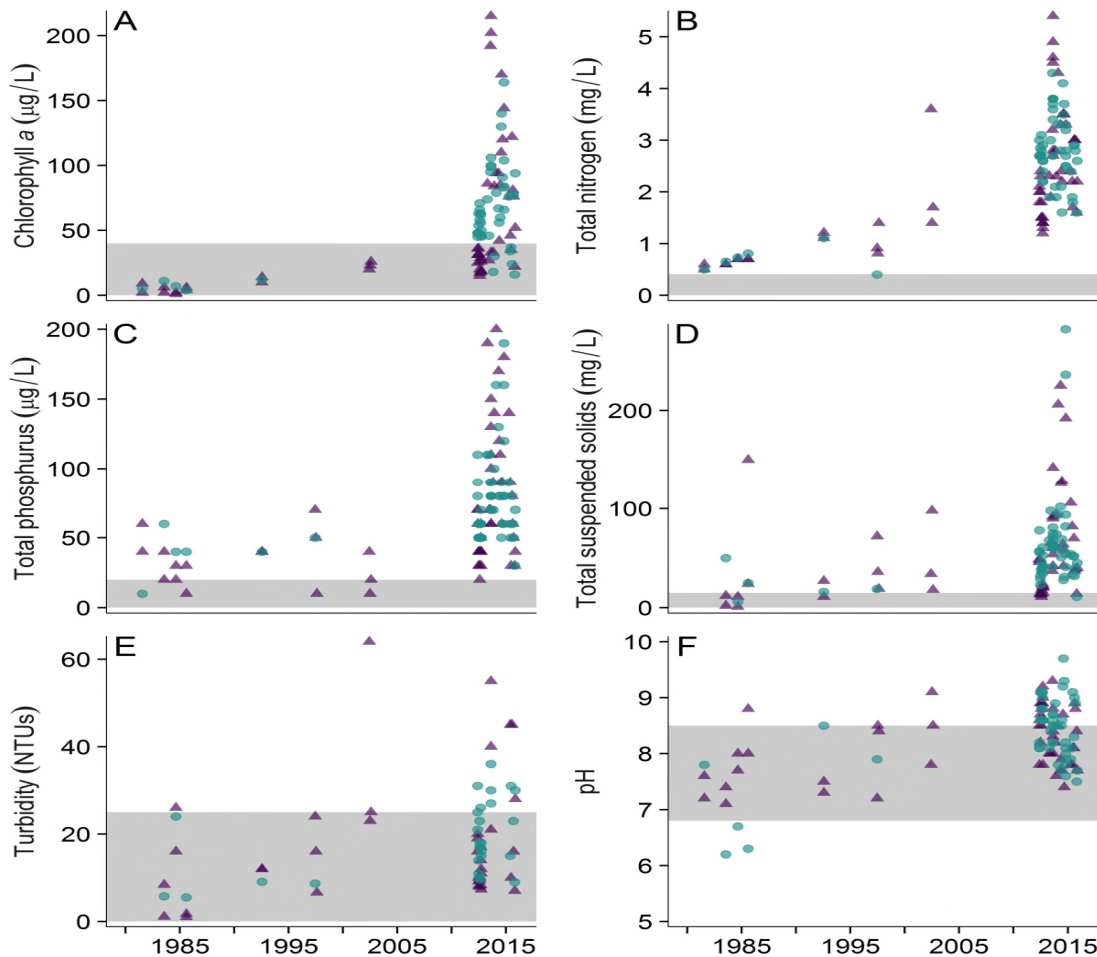
Current state: Turbid waters dominated lacking SAV



Previous state: Healthy SAV community with clear water



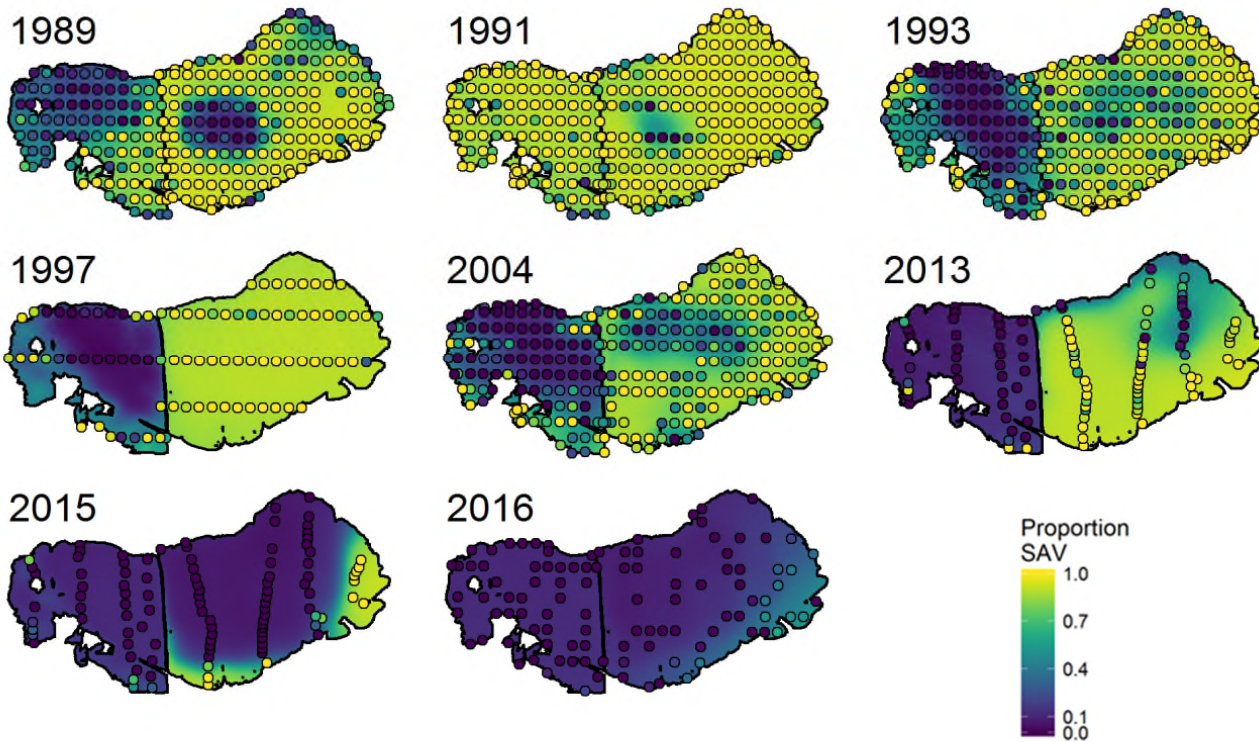
I&M support initiated long-term water-quality monitoring and assisted with data analysis



Water Monitoring Station at Mattamuskeet NWR funded by I&M

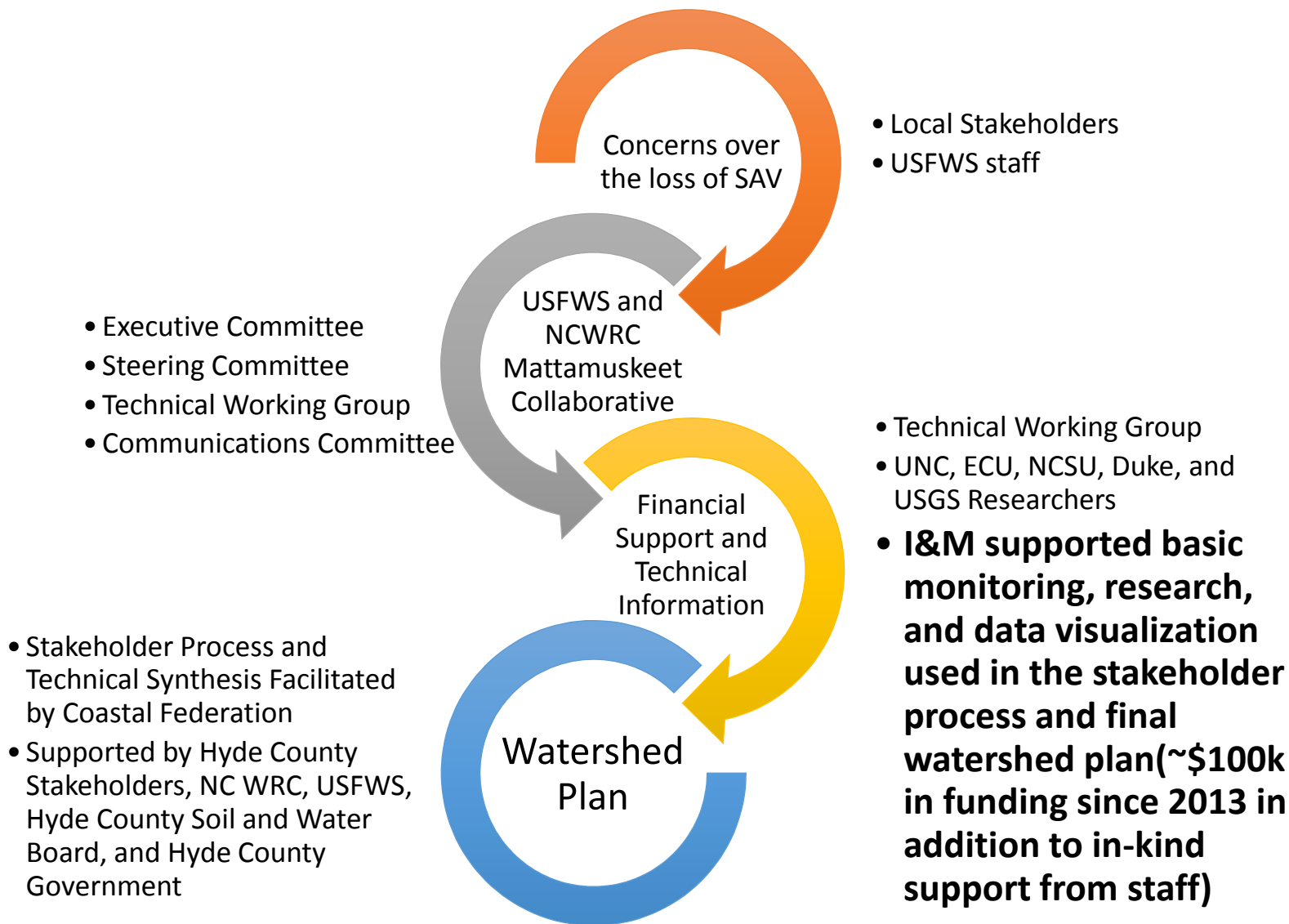


I&M ecologists assisted Refuge with data analysis and visualization used to engage stakeholders – these maps





I&M Science Support at Mattamuskeet NWR led to development of Watershed Restoration plan





Status of Southeast Water Resource Program

- **Nationally:** On track to complete 49 WRIAs by 2021
- **Regionally:** Developing regional summary reports and considering development of a regional dashboard
- **Refuge Specific:** Working with Refuges to develop site specific projects aimed at improving our understanding and our management of the system



Waterfall in Fern Cave NWR



National Wildlife Refuge System Needs

- We need basic information on our Refuge habitats and infrastructure in a centralized place
- We need to capture existing data from outside agencies and provide the information in a meaningful way to Refuges
- We need applied science that can inform conservation practices and help us adapt to changing environments



*Flooding at a water control structure at Mattamuskeet NWR,
Structures were geospatially documented by a fellow in 2016*



Data is an asset when it is utilized and communicated effectively



Public Stakeholder meetings in Hyde County were used to communicate about concerns at Lake Mattamuskeet and find common ground among stakeholders



Questions?

Michelle Moorman

USFWS Inventory and Monitoring Ecologist

Michelle_moorman@fws.gov

Let's talk about how we can partner!

